R-C Thermal Model Parameters

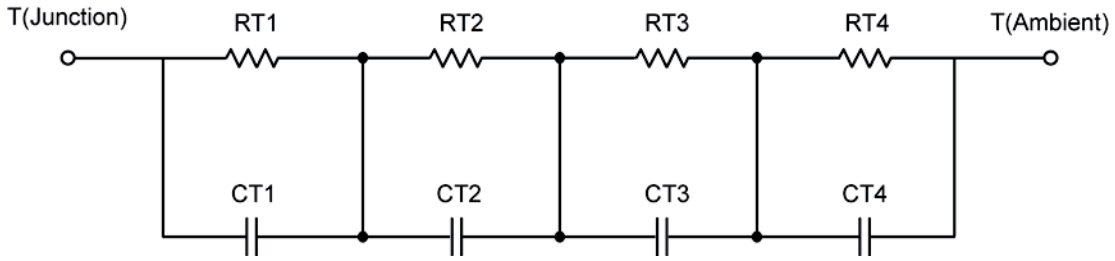
DESCRIPTION

The parametric values in the R-C thermal model have been derived using curve-fitting techniques. These techniques are described in "A Simple Method of Generating Thermal Models for a Power MOSFET"[1]. When implemented in P-Spice, these values have matching characteristic curves to the Single Pulse Transient Thermal Impedance curves for the MOSFET.

R-C values for the electrical circuit in the Foster/Tank and Cauer/Filter configurations are included.

Note:
For a detailed explanation of implementing these values in P-SPICE, refer to Application Note AN609 Thermal Simulations Of Power MOSFETs on P-SPICE Platform.

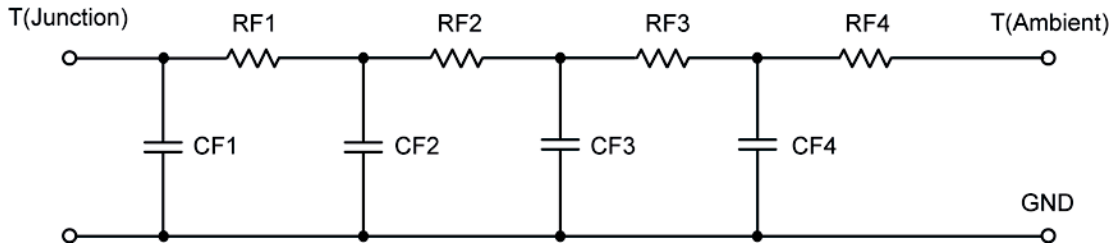
R-C THERMAL MODEL FOR TANK CONFIGURATION



R-C VALUES FOR TANK CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Case**	**Foot Nch**	**Foot Pch**
RT1	11.9237	11.6551	N/A	1.8338	5.7546
RT2	22.2207	21.7241	N/A	6.7663	1.6151
RT3	23.0980	22.9616	N/A	14.9480	11.2701
RT4	52.7576	53.6592	N/A	16.4519	16.3602
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Case**	**Foot Nch**	**Foot Pch**
CT1	3.7605 m	4.9324 m	N/A	424.5540 u	35.1661 m
CT2	32.3486 m	26.5641 m	N/A	6.5595 m	696.8633 u
CT3	78.8448 m	115.7290 m	N/A	10.1663 m	7.5228 m
CT4	1.6411	1.4529	N/A	73.8610 m	102.5510 m

This document is intended as a SPICE modeling guideline and does not constitute a commercial product data sheet. Designers should refer to the appropriate data sheet of the same number for guaranteed specification limits.

R-C THERMAL MODEL FOR FILTER CONFIGURATION

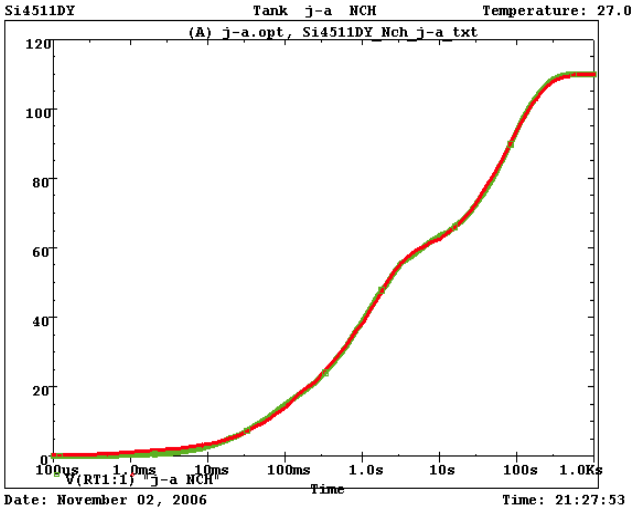


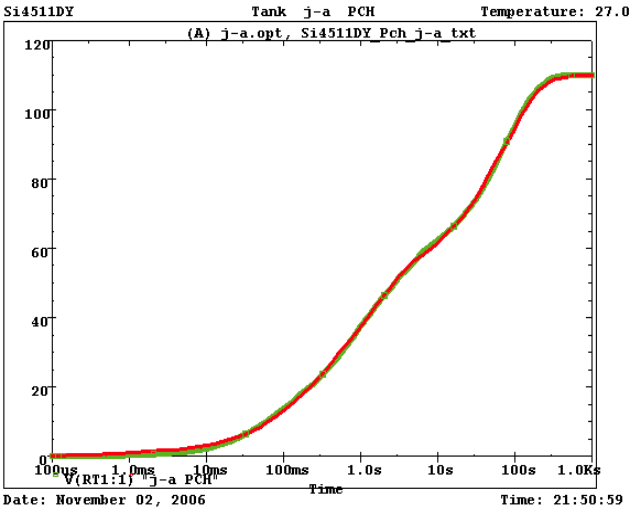
R-C VALUES FOR FILTER CONFIGURATION					
Thermal Resistance (°C/W)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Case**	**Foot Nch**	**Foot Pch**
RF1	15.3999	14.5179	N/A	3.2996	2.5280
RF2	28.3962	25.7797	N/A	11.0629	16.0608
RF3	15.9040	19.6247	N/A	12.3911	12.9836
RF4	50.2999	50.0777	N/A	13.2464	3.4276
Thermal Capacitance (Joules/°C)					
Junction to	**Ambient Nch**	**Ambient Pch**	**Case**	**Foot Nch**	**Foot Pch**
CF1	3.2305 m	3.6966 m	N/A	703.2388 u	1.0962 m
CF2	18.5540 m	15.1066 m	N/A	3.3968 m	4.8959 m
CF3	58.8983 m	103.6731 m	N/A	4.0076 m	62.5752 m
CF4	1.6460	1.4175	N/A	78.3357 m	634.0483 m

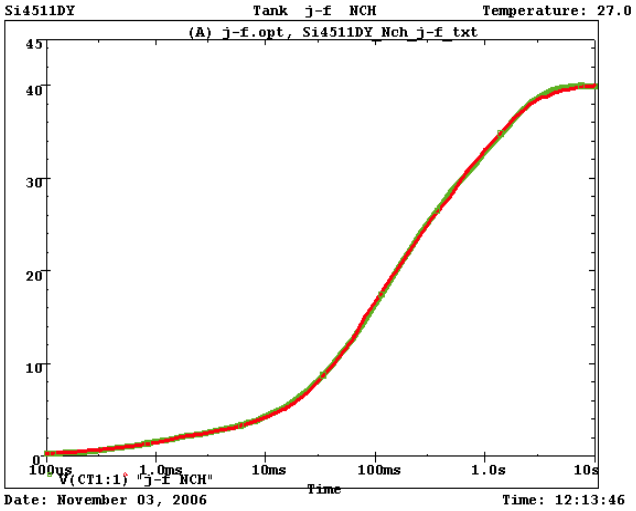
Note: NA indicates not applicable

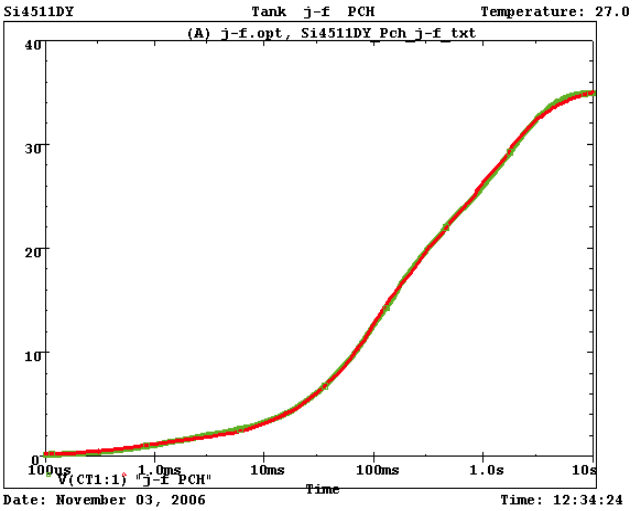
Reference:

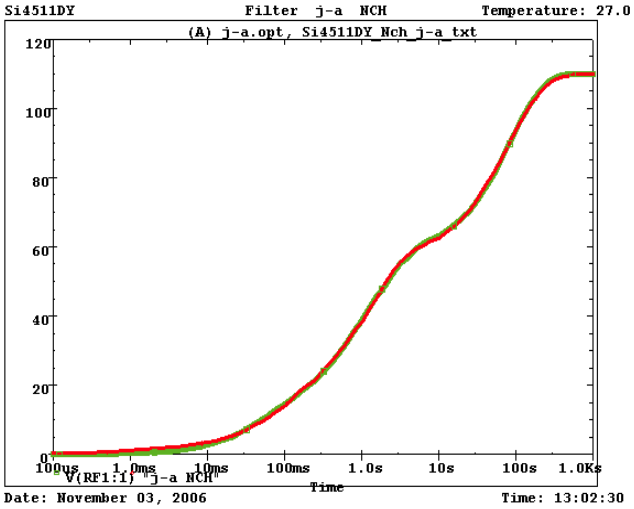
[1] "A Simple Method of Generating Thermal Models for a Power MOSFET" by Wharton McDaniel and Kandarp Pandya, IEEE / SEMITHERM 2002

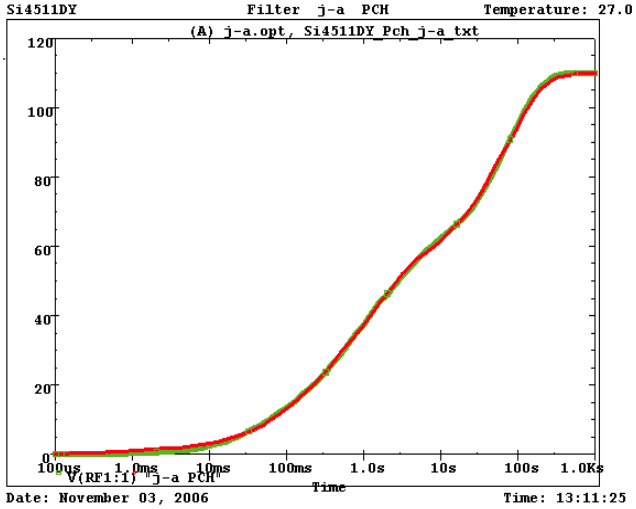

Si4511DY
Tank j-a NCH
Temperature: 27.0
(A) j-a.opt, Si4511DY_Nch_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1) "j-a NCH"
Time
Date: November 02, 2006
Time: 21:27:53

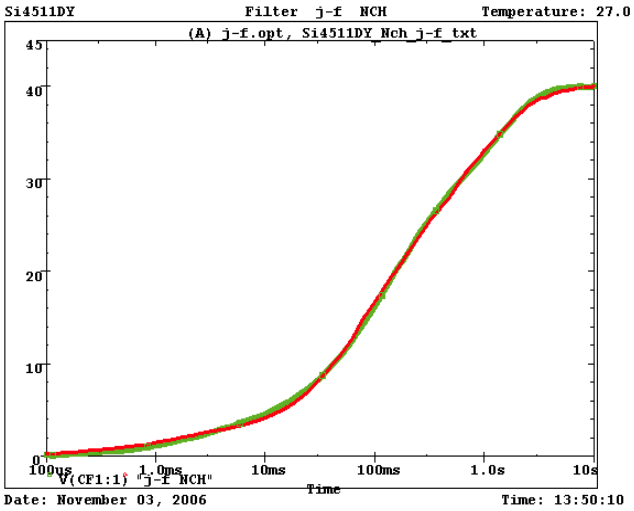

Si4511DY
Tank j-a PCH
Temperature: 27.0
(A) j-a.opt, Si4511DY_Pch_j-a_txt
120
100
80
60
40
20
0
100us
1.0ms
10ms
100ms
1.0s
10s
100s
1.0Ks
V(RT1:1) "j-a PCH"
Time
Date: November 02, 2006
Time: 21:50:59

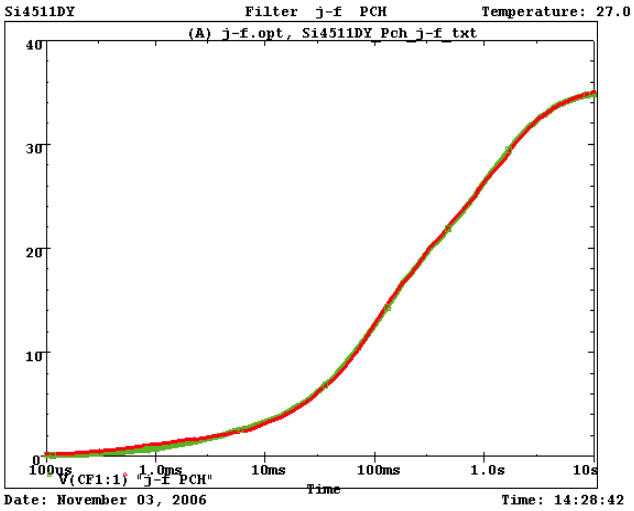

Si4511DY
Tank j-f NCH
Temperature: 27.0
(A) j-f.opt, Si4511DY_Nch_j-f_txt
45
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CT1:1) "j-f NCH"
Time
Date: November 03, 2006
Time: 12:13:46


Si4511DY
Tank j-f PCH
Temperature: 27.0
(A) j-f.opt, Si4511DY_Pch_j-f_txt
40
30
20
10
0
100us
1.0ms
10ms
100ms
1.0s
10s
V(CT1:1) "j-f PCH"
Time
Date: November 03, 2006
Time: 12:34:24


Si4511DY
Filter j-a NCH
Temperature: 27.0
(A) j-a.opt, Si4511DY_Nch_j-a_txt
120
100
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RF1:1) "j-a NCH"
Time
Date: November 03, 2006
Time: 13:02:30


Si4511DY
Filter j-a PCH
Temperature: 27.0
(A) j-a.opt, Si4511DY_Pch_j-a_txt
120
100
80
60
40
20
0
100us 1.0ms 10ms 100ms 1.0s 10s 100s 1.0Ks
V(RF1:1) "j-a PCH"
Time
Date: November 03, 2006
Time: 13:11:25


Si4511DY
Filter j-f NCH
Temperature: 27.0
(A) j-f.opt, Si4511DY_Nch_j-f_txt
45
40
30
20
10
0
100us 1.0ms 10ms 100ms 1.0s 10s
V(CF1:1) "j-f NCH"
Time
Date: November 03, 2006
Time: 13:50:10


Si4511DY
Filter j-f PCH
Temperature: 27.0
(A) j-f.opt, Si4511DY_Pch_j-f_txt
40
30
20
10
0
100us 1.0ms 10ms 100ms 1.0s 10s
V(CF1:1) "j-f PCH"
Time
Date: November 03, 2006
Time: 14:28:42